

Having described the invention the following is claimed:

1. A process for preparing a free-flowing, phase-stabilized ammonium nitrate, said process comprising the following steps:

preparing a solution of ammonium nitrate, a surfactant, a phase stabilizer, and an inert liquid;

atomizing the solution to form a stream of droplets;

freeze-drying the droplets to form agglomerates of crystals of phase stabilized ammonium nitrate, the crystals of phase stabilized ammonium nitrate in the agglomerates being coated with a film comprising the surfactant; and

disintegrating the agglomerates into separated free-flowing phase stabilized ammonium nitrate crystals coated with a film comprising a surfactant.

2. The process of claim 1 wherein the inert liquid is water.

3. The process of claim 2 wherein the surfactant is a polyvinyl pyrrolidone.

4. The process of claim 1 wherein the phase stabilized ammonium nitrate crystals have an average diameter of about $1\mu\text{m}$ to about $20\mu\text{m}$.

5. The process of claim 1 wherein the amount of surfactant in the solution is from about 0.01% to about 0.15% based upon the combined weight of the ammonium nitrate and the surfactant.

6. The process of claim 1 wherein the phase stabilizer comprises potassium nitrate.

7. The process of claim 1 wherein the freeze-drying step comprises:

cooling the stream of droplets to a temperature below the freezing point of the solution of ammonium nitrate, inert liquid, surfactant, and phase stabilizer, and

sublimating the frozen droplets to remove the inert liquid from the frozen droplets and form the phase stabilized ammonium nitrate.

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8. The process of claim 7 wherein the cooling step is performed by contacting the stream of droplets with a cooling means maintained at temperature below about -130°C .

9. The process of claim 8 wherein the cooling means is a drum with outer surface temperature of below about -130°C .

10. Free-flowing, phase-stabilized ammonium nitrate prepared by the process of claim 1.

11. A process for preparing phase-stabilized ammonium nitrate comprising the steps of:

preparing an aqueous solution of ammonium nitrate, a surfactant, and potassium nitrate;

atomizing the aqueous solution to form a stream of droplets;

cooling the stream of droplets to a temperature below the freezing point of the solution;

sublimating the frozen droplets to remove the water from the frozen droplets to form agglomerates of crystals of phase stabilized ammonium nitrate, said crystals of phase stabilized ammonium nitrate in the agglomerates being coated with a film of surfactant; and

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disintegrating the agglomerates into separated free-flowing phase stabilized ammonium nitrate crystals coated with a film comprising the surfactant.

12. The process of claim 11 wherein the phase stabilized ammonium nitrate crystals have an average diameter of about $1\mu\text{m}$ to about $20\mu\text{m}$.

13. The process of claim 11 wherein the amount of surfactant in the solution is from about 0.01% to about 0.15% based upon the combined weight of the ammonium nitrate and the surfactant.

14. Phase-stabilized ammonium nitrate prepared by the process of claim 11.